studies of smoking cessation smokers' activities in attempting to stop smoking should be measured in tandem with more conventional measures of the rate of cessation.⁴ Attempts to stop are associated with the final goal of continuous abstinence. Changes in the number of attempts to stop may thus be more sensitive to intervention than the dichotomous outcome of smoking cessation.

This is just one suggestion, and much work is required to validate any new outcome measures.⁵ The results of Cupples and McKnight's study² suggest, however, that careful consideration of appropriate outcomes is vital to improving our knowledge about how we should approach health promotion.

TIM COLEMAN
Honorary clinical research fellow

Department of General Practice,
University of Leicester,
Leicester General Hospital,
Leicester LE5 4PW

- 1 Stott NCH, Kinnersley P, Rollnick S. The limits to health promotion. *BMJ* 1994;309:971-2. (15 October.)
- 2 Cupples ME, McKnight A. Randomised controlled trial of health promotion in general practice for patients at high risk of cardiovascular risk. *BMJ* 1994;309:993-6. (15 October.)
- 3 DiClemente CC, Prochaska JO. Self change and therapy change of smoking behaviour: a comparison of processes of smoking change in cessation and maintenance. In: Schiffman S, Wills TA, eds. *Coping with substance abuse*. New York: Academic Press, 1985:318-43.
- 4 Velicer WF, Prochaska JO, Rossi JS, Snow MG. Assessing outcome in smoking cessation studies. *Psychol Bull* 1992;111:23-41.
- 5 Steen N, Hutchinson A, McColl E, Eccles MP, Hewison J, Meadows KA, et al. Development of a system based outcome measure for asthma. *BMJ* 1994;309:1065-9. (22 October.)

Target all risk factors

EDITOR,—Like M E Cupples and A McKnight, we are interested in health promotion in general practice for patients with a high cardiovascular risk.¹ We surveyed 34 patients one year after coronary artery bypass grafting.

In relation to exercise, as might be expected, more patients walked over one mile (1.6 km) a day after the operation than they had done before (24 v 20, P=0.07) and fewer patients took no exercise at all (10 v 14). Most, especially those attending diabetic clinics, had greatly improved their diets, reducing their overall intake and saturated fat intake. The mean number of units of alcohol consumed by men had dropped from 42 to 11 (P=0.002). Cholesterol concentrations were being monitored in all the patients, 13 of whom were taking lipid lowering drugs. Only five patients did not know their last result. There were no changes in body mass index postoperatively. No patient had restarted smoking, although four continued to smoke but at greatly reduced levels. Blood pressure was being checked regularly in 28 patients; nine were receiving hypotensive treatment.

All patients were questioned about information given to them about lifestyle modification. They had received help from a range of sources: their general practitioner, hospital factsheets, personal contact in hospital at the time of surgery, other hospital clinics (especially the diabetic clinic), and the hospital dietitian. Most information had been on diet and the least on exercise. Eleven patients would have liked more information on some aspect of lifestyle modification. Those from ethnic minorities fared as well as the rest, although they volunteered that they had obtained most of the information from their general practitioner.

Thus, like Cupples and McKnight, we found that our patients' diet had been greatly influenced by the information provided perioperatively and that cholesterol and blood pressure monitoring by general practitioners was common. Obesity, however, had not been influenced, and exercise had increased, although most probably as a direct effect of the operation.

Emphasis must continue to be placed in the

community on counselling patients with ischaemic heart disease and on treating all their cardiovascular risk factors.

M J STEPHEN
House officer
A M PORTER
Cardiothoracic liaison nurse specialist
D J M KEENAN
Consultant cardiothoracic surgeon

Department of Cardiothoracic Surgery,
Manchester Royal Infirmary,
Manchester M13 9WL

- 1 Cupples ME, McKnight A. Randomised controlled trial of health promotion in general practice for patients at high cardiovascular risk. *BMJ* 1994;309:993-6. (15 October.)

Doctors' right to refuse to perform abortions

Law doesn't include GPs and junior doctors

EDITOR,—C G B Simpson believes that doctors' right to refuse to perform abortions should be curtailed.^{1,2} This right is enshrined in section 4 (paragraph 1) of the Abortion Act 1967. Although this section says that no person need participate in an abortion if he or she has a conscientious objection, the House of Lords ruled that this applied only to people performing abortions. In two cases it made clear that neither secretaries nor nurses had a legal right to refuse to participate in abortions.³ Despite this general practitioners and junior doctors still believe that this paragraph of the act applies to them; this is probably not the case.

With regard to general practitioners, is there a legal obligation to sign the relevant green form? General practitioners' terms of service state that "a doctor shall render to his patients . . . services of the type usually provided by General Practitioners . . . arranging for the referral of patients as appropriate."⁴ It has been argued that this means that the general practitioner has a legal obligation to pass on the patient to a consultant gynaecologist with a view to obtaining a termination of pregnancy.⁵ (This would be the service normally provided by general practitioners.) Provided that the conditions on the green form are met, the general practitioner can take no refuge in the clause of the Abortion Act permitting conscientious objection and has a legal duty to sign the form.

As far as junior doctors are concerned, their position is similar to that of the secretary in the Janaway case; provided that they are not taking direct responsibility for performing the abortion they probably have a duty to clerk and deal with the patient as they would any other.

DENNIS COX
Clinical teacher

Unit of General Practice,
Addenbrooke's Hospital,
Cambridge CB2 2QQ

- 1 Simpson CGB. Doctors' right to refuse to perform abortions. *BMJ* 1994;309:1090. (22 October.)
- 2 Dooley D. Conscientious refusal to assist with abortion. *BMJ* 1994;309:622-3. (10 September.)
- 3 Janaway v Salford Health Authority [1989] AC, [1988] 3 All ER 1079 (HL).
- 4 NHS (general medical services) regulations 1992. London: HMSO, 1992:schedule 2, paragraph 12 (1) and (2).
- 5 Kennedy I, Grubb A. *Medical law*. 2nd ed. London: Butterworths, 1994:896.

Antiabortion views are not incompatible with gynaecology

EDITOR,—C G B Simpson's proposal to curtail doctors' right to conscientious objection to performing abortion is not new¹ and was championed by Sturatt, who believed that doctors holding a strict pro-life view should not specialise in obstetrics and gynaecology.² Is this because the

going will be tough for the doctor (for it will be) or to protect the patient from the doctor? Admittedly, if Dr X will not carry out abortions Dr Y has to do them all. Yet is this sufficient reason to force conscientious male and female clinicians against abortion out of gynaecology?

It is important to remember that gynaecologists are also obstetricians. There is an increasing demand on the part of many women opposed to abortion to be looked after by doctors who are not going to do an abortion in the morning and deliver their baby in the afternoon. The doctor "may think he can keep the two functions separate in his mind, but the unconscious influence will be insidious."³ Interestingly, some doctors have become disillusioned with abortion in the course of medical practice. Noteworthy is Nathanson, who stopped performing abortions after running one of the largest abortion clinics in the United States.⁴ Should the public be denied the clinical acumen of such professionals?

Finally, while there is no such thing as a right to become a gynaecologist, doctors are not required to acquiesce to all their patients' wishes in any branch of medicine. Surely our dilemma is whether abandonment of the spirit of the Geneva declaration—"utmost respect for human life from the time of conception"—is compatible with being what our patients need.

R W McCALLUM
Final year medical student

Department of Gynaecology,
Glasgow Royal Infirmary,
Glasgow G4 0SF

- 1 Simpson CGB. Doctors' right to refuse to perform abortions. *BMJ* 1994;309:1090. (22 October.)
- 2 Sturatt G. *Legalised abortion—the continuing dilemma*. London: C.M.F. Publishers, 1979.
- 3 Le Vay D. The Abortion Bill. *Lancet* 1976;ii:510.
- 4 Nathanson B. *Aborting America*. New York: Right to Life, 1979.

Hyperbaric oxygen in crush syndrome

EDITOR,—Andrew D Shaw and colleagues emphasise the urgent need for orthopaedic referral for the underlying problem of the compartment syndrome—namely, impending muscle necrosis.¹ They do not mention the role of adjuvant hyperbaric oxygen in this condition.

Pathophysiologically, in the compartment syndromes ischaemia and oedema create a vicious circle in which hypoxia plays a central part. Partially viable tissues may recover if hypoxia is relieved. Treatment with hyperbaric oxygen can increase tissue oxygen tensions to values higher than those achieved by any other method. 100% Oxygen at 304 kPa (3 atmospheres absolute) can produce arterial oxygen tensions of up to about 250 kPa by direct solution in plasma.² The resultant diffusion gradient into tissues is also clearly increased. Red cells become more deformable at such pressures, facilitating transport through constricted microcirculation.

Hyperbaric oxygen also produces arteriolar vasoconstriction. While this effect might seem undesirable, the hyperoxygenation itself counteracts any short term decrease in blood flow. Subsequent reduction in transcapillary flow of fluid and increased capillary resorption of extravascular fluid rapidly decrease tissue oedema. The fall in intracompartmental pressure that follows is clearly beneficial, specifically in the compartment syndrome.³ Animal models suggest a particularly effective role for hyperbaric oxygen in the compartment syndrome complicated by haemorrhagic hypotension.⁴

In the compartment syndrome hyperbaric oxygen should be given as adjuvant treatment with general resuscitation and surgery. We agree with Shaw and colleagues that surgical decompression should be considered urgently. Hyperbaric oxygen is conventionally given after surgery, using

243 kPa (2.4 atmospheres absolute) 100% oxygen for 90 minutes three times daily for the first day and twice daily thereafter.¹ In cases of surgical delay for any reason and in cases in which the decision is taken not to operate, hyperbaric oxygen should be used immediately if it is available; this may also assist in distinguishing viable from non-viable tissue at subsequent surgery.

The availability of hyperbaric oxygen facilities in Britain can be checked with the hyperbaric unit at Whipps Cross Hospital, London E11 1NR (tel 0181 539 5522, extension 5150).

MARTIN R HAMILTON-FARRELL
Director

Hyperbaric Unit,
Whipps Cross Hospital,
London E11 1NR

TARUN SAHNI
Director of medical services
(research and training)

Naval Headquarters,
New Delhi,
110011 India

- 1 Shaw AD, Sjolin SU, McQueen MM. Crush syndrome following unconsciousness: need for urgent orthopaedic referral. *BMJ* 1994;309:857-9. (1 October.)
- 2 Touhey JE, Davis JC, Workman WT. Hyperbaric oxygen therapy. *Orthop Rev* 1987;16:829-33.
- 3 Strauss MB, Hargens AR, Gershuni DH, Greenberg DA, Crenshaw AG, Hart GB, et al. Reduction of skeletal muscle necrosis using intermittent hyperbaric oxygenation in a model compartment syndrome. *J Bone Joint Surg Am* 1983;65:656-62.
- 4 Skyhar MJ, Hargens AR, Strauss MB, Gershuni DH, Hart GB, Akeson WH. Hyperbaric oxygen reduces edema and necrosis of skeletal muscle in compartment syndromes associated with haemorrhagic hypotension. *J Bone Joint Surg [Am]* 1986;68:1218-24.
- 5 Hamilton-Farrell MR. What is hyperbaric oxygen therapy? In: Morgan D, ed. *Clinical hyperbaric medicine facilities in the UK*. London: Board of Science and Education, British Medical Association, 1993.

Overdosage during patient controlled analgesia

Mount syringes vertically . . .

EDITOR,—D A Southern and M S Read report on a patient who received an overdosage of opiate while using patient controlled analgesia.¹ Such an overdosage is not, however, a specific consequence of this technique but can occur with any infusion syringe, so it is not only anaesthetists who need to be aware of this risk. Infusion of insulin, for example, could be equally dangerous and might similarly be given in relatively low dependency areas.

Such events must be rare, but the fact that they may happen with a damaged syringe has been unequivocally shown.² In this latest case the syringe was "normal on close examination." When I duplicated the administration set used I found that perforating the 50 ml syringe plunger with a 20 gauge cannula resulted in virtually free flow, given a gravitational advantage of as little as 5 cm. Such a small leak might not be apparent on visual inspection, but ideally the syringe that was used should also be tested under pressure and the remainder of that batch looked at by the manufacturers. Failure to examine formally the relevant equipment means that the one reported lethal case of overdosage with patient controlled analgesia remains unexplained.³

Infusion syringes are frequently mounted horizontally and at some height above the patient. In such an orientation an airlock should develop before the syringe is completely emptied. The outcome would probably have been far worse if the syringe had been mounted pointing downwards. This situation is often exacerbated by the omission of antisiphon valves.

The solution is always to mount syringes vertically with the outlet uppermost at or even below the level of the heart, but despite such precautions

an apparently fail safe system can still fail. Perhaps we should consider reverting to one of the early precepts of patient controlled analgesia—namely, that the syringe should contain only a "survivable dose."² In Nottingham, for example, when using morphine we use 60 mg in 60 ml, though more frequent changes of syringe then carry their own potential for operator error.

Patient controlled analgesia (and, by implication, other infusion techniques) has a good safety record,⁴ but current practice is far from ideal. We should recognise that syphoning is a practical as well as a theoretical risk with any infusion syringe. Despite these problems, if the measures suggested above are used we can still hope to see this technique proved to be more effective than, or at least as safe as, the alternatives.

D H ELCOCK
Senior house officer in anaesthesia

Nottingham City Hospital,
Nottingham NG5 1PB

- 1 Southern DA, Read MS. Overdosage of opiate from patient controlled analgesia devices. *BMJ* 1994;309:1002. (15 October.)
- 2 Thomas DW, Owen H. Patient controlled analgesia—the need for caution. *Anaesthesia* 1988;43:770-2.
- 3 Grey TC, Sweeney ES. Patient controlled analgesia. *JAMA* 1988;259:2240.
- 4 White PF. Mishaps with patient controlled analgesia. *Anaesthesiology* 1987;66:81-3.

. . . and below the level of the patient

EDITOR,—It is helpful to be reminded of the dangers of siphonage from patient controlled analgesia devices¹ or, indeed, from any raised fluid reservoir in continuity with a patient's venous system. The valve that D A Southern and M S Read describe, however, is a one way valve. It would not prevent siphonage from a syringe raised any great height above a patient. If the syringe is placed at or slightly below the level of the patient, as in the lower drawing in the figure in the paper, the valve would prevent the back flow of blood in the event of the syringe leaking—that is, it would prevent back siphonage but not forward siphonage. This seems a practical and safe arrangement as the other suggestion of placing the syringe with its outlet at the top is often difficult. We commonly use syringe pumps to deliver opioid infusions in our children's wards; these pumps usually do not have locked controls. If the syringe pump is at a low level some form of "antihandling" device should be incorporated to prevent toddlers amusing themselves.

R J BRAY
Consultant anaesthetist
C J VALLIS
Consultant anaesthetist

Royal Victoria Infirmary,
Newcastle upon Tyne NE1 4LP

- 1 Southern DA, Read MS. Overdosage of opiate from patient controlled analgesia devices. *BMJ* 1994;309:1002. (15 October.)

Follow manufacturers' instructions

EDITOR,—Siphoning from the syringe of a patient controlled analgesia device into the patient, reported by D A Southern and M S Read,¹ is a well known potential problem and was first clearly described by Thomas and Owen.² Southern and Read quote this reference but do not give due explanation.

I was surprised to find that this "lesson" emanated from my department as we do not undertake orthopaedics or use the Graseby PCAS machine in our hospital; it is therefore misleading of the authors to give the impression that this problem occurred in the University Hospital of Wales. The acute pain service at the University Hospital of Wales treats between 2000 and 2500 patients with patient controlled analgesia each year, and we

always use both antisiphon and unidirectional valves on our infusion lines for patient controlled analgesia. This has been our policy since the formation of the acute pain service in 1990. It is unfortunate that colleagues working in another unit in Cardiff were not aware of this problem.

This lesson is well known to those who regularly provide patient controlled analgesia, and most, if not all, manufacturers of patient controlled analgesia machines supply suitable infusion sets with protective valves included. If the correct equipment is used the authors' proposal that the outlet of the syringe should be positioned uppermost is unnecessary and, indeed, encourages others to ignore the safety measure of including an antisiphon valve.

Surely in this case the lesson should be: if you are going to use a piece of equipment it is wise to read the instructions and understand what you are doing.

MICHAEL HARMER
Director of acute pain service

University Hospital of Wales,
Cardiff CF4 4XW

- 1 Southern DA, Read MS. Overdosage of opiate from patient controlled analgesia devices. *BMJ* 1994;309:1002. (15 October.)
- 2 Thomas DW, Owen H. Patient controlled analgesia—the need for caution. *Anaesthesia* 1988;43:770-2.

Authors' reply

EDITOR,—The incident that we reported did indeed occur at a different unit in Cardiff, and not at the University Hospital of Wales. Siphoning is well known to acute pain specialists but is unfamiliar to others—hence the need for a Lesson of the Week. An informal survey that we performed in 1993 showed that only a minority of hospitals in which patient controlled analgesia is used use antisiphon devices. Most use cheaper "minimal volume" infusion lines instead. We agree with Michael Harmer that those who use any item of equipment should read the instructions and know what they are doing, but as patient controlled analgesia equipment has proliferated to many low dependency areas it is being used by staff who are less familiar with this technology. It is therefore more important than ever that the equipment itself should incorporate the highest standards of safety. We believe that antisiphon valves are mandatory and should be complemented by other safety features, including having the syringe with its outlet uppermost. Our report was of a malfunction in a mechanical device: it is not impossible that some future case report will describe a malfunction in an antisiphon valve.

DAVID SOUTHERN
Registrar

Townsville General Hospital,
Townsville,
Queensland 4810,
Australia

M S READ
Consultant in anaesthetics and intensive care

University Hospital of Wales,
Cardiff CF4 4XW

Circadian variation in deliberate self poisoning

EDITOR,—Roberto Manfredini and colleagues present data showing circadian variation in the incidence of deliberate self poisoning as determined by assessment of admissions to an Italian accident and emergency department.¹ I am concerned, however, by their conclusion that "treatment of depressive disorders might therefore be improved by aiming for peak drug concentrations at vulnerable times."

A large proportion of their patients would not have been suffering from a depressive disorder and would therefore have been unlikely to benefit